Traube's Rule for Organic Solutions of Lower Aliphatic Alcohols

AUTHOR(S):

Aida, Hiroshi; Yamakita, Itsuro

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Rubine numbers were examined and following results were obtained as shown in Table 1.

Table 1. Rubine Numbers of Surfactants.
Concentration of Congo Rubine: 0.01%.
Concentration of KCl: 160m. mole/l.

Surfactants		Rubine Number	
		g./100 cc.	mole/l.
Na- Oleate		1.0	$3.1\ 10^{-2}$
Na- Laurylsulfate		0.5	$1.1\ 10^{-2}$
(Gelatin)		0.072	——
L. P - 6*	(Polyoxyethylene alkyl ether)	0.017	$3.8\ 10^{-4}$
L. P - 6		0.020	4.4 〃
L. P - 17		0.036	3.1 〃
C. P - 8		0.018	3.1 〃
C. P - 10		0.022	3.3 〃
C. P - 18		0.013	1.3 〃
O. P - 20		0.013	1.1 〃
Trimethyl cetyl ammonium bromide		0.005	1.17 〃
Nissan Cation SA		0.005	——

L: Lauryl; C: Cetyl; O: Oleyl,
P-n: Degree of polymerisation of ethylene oxide,
*: Synthesised in the authors' laboratory.

Comparing with anionic surfactants, non-ionics and cationics showed remarkable protective power for Congo Rubine which is an anionic dyestuff, and cationics induced distinct coagulation Congo Rubine, without color change, while precipitation of the dye-stuff by KCl accompanies distinct color change.

It may be noticeable that even anionic surfactants have some protective power for anionic Congo Rubine. This fact and remarkable protective power of non-ionics suggest that interaction between surfactants and dyestuffs is not necessarily ionic.

11. Traube's Rule for Organic Solutions of Lower Aliphatic Alcohols

Hiroshi AIDA and Itsuro YAMAKITA

(Goto Laboratory)

Concerning the surface tension of the solutions, Traube's rule has been confirmed mainly on the aqueous systems and its extension to the non-aqueous, *e. g.* the organic systems has not been examined thoroughly as yet. In order to find some informations about this problem, the authors prepared various solutions, using one of the homologous series of lower aliphatic alcohols ($C_1 \sim C_5$) as a solute and ethylene glycol or nitrobenzene as a solvent, and measured the surface tension of the solutions at 20°C. The results

obtained show that Traube's rule holds for the non-aqueous systems and the correlation between the surface tension depression of the solution (F) and the mole fraction of the solute in the bulk phase (C) can be expressed accurately by the equation

$$F = nkT \log \left(\frac{C}{\alpha} + 1\right)$$

where k is Boltzmann's constant, T is the absolute temperature, n is a surface chemical constant giving the total number of sites of adsorbed molecules in a monolayer per unit area of the surface when no interaction between the adsorbed molecules exists, and α is another surface chemical constant relating to the adsorption energy of the solute molecule on the solution surface. The values of n and α determined from the experimental data are indicated in Table 1.

Table 1. Values of n and α.

	n		α	
	E	N	N	E
Methyl alcohol	$4.02 \cdot 10^{14}$	$5.32 \cdot 10^{14}$	$365.0 \cdot 10^{-3}$	$351.0 \cdot 10^{-3}$
Ethyl 〃	3.38 〃	4.08 〃	114.4 〃	224.0 〃
n-Propyl	2.42 〃	3.21 〃	50.0 〃	153.0 〃
n-Butyl	2.01 〃	2.70 〃	16.6 〃	111.7 〃
n-Amyl 〃	1.73 〃	2.06 〃	7.7 〃	41.3 〃

E and N denote the cases where the solvents are ethylene glycol and nitrobenzene, respectively.

12. Determination of Density Change of Glass by the Sink-Float Method. (VII)

Precision of Density Measurements

Masao MINE, Torao NOBUSAWA and Ayako KAWABATA

(Sawai Laboratory)

For some years, determination of glass densities with the sinkfloat method for the purpose of the composition control have been utilized successfully by many glass manufacturing factories in Japan. The authors applied the method to measure small variations in glass density for studying the configurational changes of glass during heat treatments in the annealing range (*This Bulletin*, **20**, 54 (1950); **24**, 71; **25**, 70 (1951); 28, 60 (1952)). The water solution of potassium mercuric iodide was found sufficiently available as the buoyant liquid (*ibid.*, **19**, 52, (1949)). In this country, thereafter, mainly the water solution of the complex salt have been used for the composition control of glass in factory practice. To investigate the precision of the method,